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Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs: Annual Report 2018

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Annual Summary Report

Project Title:

Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs: Phase III

Project Number: RCREP18006

Contractor Information:

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Reporting Period: July 1, 2018- December 31, 2018

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Project Objectives:

(1) Continue established monitoring program that provides a basin-wide assessment of status and trends for aquatic life in wadeable streams associated with varying percentages of the watershed area enrolled to Conservation Reserve Enhanced Program (CREP) (i.e., CREP rate) in the Kaskaskia River Basin; (2) conduct targeted surveys in reaches with less-disturbed watersheds to improve coverage along the gradient of CREP rate within the basin; (3) continue monitoring of key fish populations within the Kaskaskia River; (4) continue monitoring of paired streams associated with different CREP rate; (5) engage in collaborative effort with IDNR to identify watersheds for suitable for land-use manipulation; (6) provide technical support for IDNR's Private Lands Programs.

Project Title: Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs: Phase III (Progress Report for 7/1/2018-12/31/2018)

Project Objectives:

(1) Continue established monitoring program that provides a basin-wide assessment of status and trends for aquatic life in wadeable streams associated with varying percentages of the watershed area enrolled to Conservation Reserve Enhanced Program (CREP) (i.e., CREP rate) in the Kaskaskia River Basin; (2) conduct targeted surveys in reaches with less-disturbed watersheds to improve coverage along the gradient of CREP rate within the basin; (3) continue monitoring of key fish populations within the Kaskaskia River; (4) continue monitoring of paired streams associated with different CREP rate; (5) engage in collaborative effort with IDNR to identify watersheds for suitable for land-use manipulation; (6) provide technical support for IDNR's Private Lands Programs.

Background:

Summary of Work in Phase I (2013-2015)

A full account of the work completed in Phase I of this project can be seen in Metzke and Hinz (2017a). The primary objectives of Phase I focused on establishing a basin-wide assessment of status and trends of aquatic life in wadeable stream reaches, surveys in targeted stream segments which contain species with conservation status (*i.e.* focal reaches), and surveys at established Illinois State Water Survey CREP reaches (*i.e.* fixed site monitoring). In addition to the primary objectives the project supported two graduate student research projects investigating the relationships between CRP density and aquatic assemblages for fish assemblages and macroinvertebrate assemblages, respectively. A total of 144 reaches were surveyed in Phase I.

Summary of Work in Phase II (2016-2017)

The aim of Phase II was to continue monitoring and assessing aquatic life in the Kaskaskia Basin while expanding on the goals of the first phase of the project (Metzke, Hinz, & Beja, 2017b). The primary objectives of Phase II focused on continuing basin-wide assessment of status and trends of aquatic life in wadeable stream reaches, expand sampling efforts of focal stream reaches, and conduct additional monitoring of key populations in the basin. Key aquatic populations included adult aquatic insects, mussels, and fish species sensitive to sedimentation. During the reporting period of 2017 the total number of reaches over the five survey season (including Phase I and II) was 240 reaches.

Summary of Work Completed During Reporting Period (7/1/2018-12/31/2018):

Throughout the reporting period, efforts have continued to assess aquatic life in the Kaskaskia River Basin. In total, 40 wadeable stream sites were sampled in 2018 at base-flow conditions to evaluate fish assemblages, benthic macroinvertebrate assemblages, stream habitat,

and water chemistry throughout the basin. The length of each sampling site was established based on a length of 20-times mean wetted width (minimum 100m, maximum 300m). The 40 sites chosen for surveys fell into one of three categories (20 basin-wide sites, 16 paired sites, and 4 less-disturbed sites) that correspond with the three of the project objectives (Figure 1).

Fish sampling using a single-pass electrofishing (e-seine or backpack) technique was conducted at 39 of the 40 sites. The single site we were un-able to sample fish was a previously established paired site with a dry stream-bed sampling season. At all sites fish were identified to species then released back to the stream. In addition, length and weight measurements of individuals from focal species selected for sensitive species monitoring were recorded at paired sites (Table 1).

Thirty-nine macroinvertebrate samples were collected using a standard multihabitat, 20-jab sampling approach (Barbour et al. 1999). The samples are currently being sorted for a 300-organism fixed-count subsample to be sent to a certified external lab for taxonomic identification. EcoAnalysts, Inc. have been contacted to conduct the identification work for comparability to samples of the previous phases of the project.

Habitat assessments were conducted at each of the 40 sites during the 2018 sampling season using the Qualitative Habitat Evaluation Index (QHEI; Ohio EPA 2006) and the Illinois Habitat Index (IHI; Sass et al. 2010). The QHEI was developed by the Ohio EPA to provide a qualitative assessment of the habitat characteristics that are important for supporting fish communities. The IHI was developed to provide a qualitative evaluation of physical habitat and the response to human degradation in upstream and local watershed, while also taking into account regional differences throughout Illinois. The combination of the QHEI and IHI assessments aids our understanding of the habitats available to aquatic life and how those habitats are changing through time.

Water chemistry parameters (dissolved oxygen, specific conductance, turbidity, pH, nitrate nitrogen, total reactive phosphorus, ammonia nitrogen, and temperature) were measured during base flow conditions at 39 of the 40 sites. These parameters were collected through a combination of Hach field test kits and a handheld water quality meter. In addition to point sampling, 19 water temperature loggers were deployed for continuous temperature sampling in select basin-wide (n=15) and paired reaches (n=4). Sites that were sampled after August did not have a temperature logger installed because we are interested in assessing mean temperatures during peak summer base flow conditions (*i.e.* July and August). Temperature loggers will be retrieved in early 2019 and the recorded data will be used to assess mean thermal regimes.

Objective 1- Basin-wide Assessment

To evaluate the current physiochemical and biological status of streams in the Kaskaskia River Basin stream segments were selected using a stratified random sampling technique (stream size and sub-basin as strata). Stream size was given two strata levels based on link number: small (link $\leq$10) and large (link $\geq$ 11). Five stream segments (three small and two large) were randomly chosen in each of the four United States Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) scale sub-basins of the Kaskaskia River Basin. One sampling site was established in each of the selected stream segments based on a length of 20-times mean wetted

width (minimum 100m, maximum 300m). During the 2018 sampling season, these 20 basin-wide status sites were surveyed for fish, benthic macroinvertebrates, habitat, and water chemistry parameters (Figure 1).

Objective 2- Less-disturbed Watersheds

To improve our understanding of the gradient of land-use within Kaskaskia River Basin, stream segments were selected with high (>50%) less-disturbed land use types for total upstream watershed. Land-use data from Great Lakes Regional Aquatic Gap Project (Holtrop et al. 2005) was used to compile a list of target stream segments in which total upstream watershed had 50% or more less-disturbed land use types. Less-disturbed land types includes all lands types that are not considered urban or agricultural (*e.g.* grassland, forest, etc.). A total of 4 less-disturbed sites were sampled within base-flow conditions of the reporting period.

Objective 3- Monitoring of Focal Fish Populations

The eleven target species were chosen in Phase II to serve as potential indicators of the effects of conservation practices in the basin due to their sensitivity to sedimentation (Table 1). During the 2018 sampling season, length and weight measurement of these focal fish species were recorded at 15 of the 16 paired sites to continue sensitive species monitoring. Greater than 1,000 individuals from the eleven focal species were measured in 2018. Length and weight relationships are frequently used as an estimate of fish condition (Bolger and Connolly 1989). These length and weigh data will be used to monitor differences in the condition of sensitive species along gradient of conservation practices in the Kaskaskia River Basin and how the condition of those species in the basin is changing throughout time.

Objective 4- Continue monitoring of paired streams associated with different CREP rate.

To continue monitoring paired streams that have variant local watershed CREP rates the 8 pairs of reaches originally selected in Phase II (Metzke et al. 2017b) were revisited in 2018. Surveys to collect fish, benthic macroinvertebrate, habitat, and water chemistry data were conducted at 15 of the 16 total sites. The single site at which full surveys were not conducted had a dry stream bed during the sampling season therefore only partial habitat data could be collected. Combined with data from previous years, the paired sites data give us a good opportunity to investigate the temporal variation and trends among and between paired sites of the Kaskaskia River Basin. .

Objective 5- Engage in collaborative effort with IDNR to identify watersheds for suitable for land-use manipulation.

During the reporting period we have identified that more information about conservation practices in the Kaskaskia River Basin beyond CRP and CREP need to be understood and accounted for while investigating potential watersheds for manipulation. There are many alternative programs available in the state of Illinois including but not limited to the Conservation Stewardship Program (CSP), Environmental Quality Incentives Program (EQIP). Agricultural Conservation Easement Program/Wetlands Reserve Program, Illinois Conservation Practices Program (CPP), and Illinois Headwaters Invasive Plant Partnership (HIPP). The more

that is known about adoption of these alternative conservation practices in the Kaskaskia River Basin the better we will understand the interactions between conservation practices as a whole and the effects on aquatic life. If we want the land-use manipulation study to have the best opportunity to see an effect on aquatic life a complete picture of potential drivers of change in aquatic life is necessary.

Objective 6- Provide technical support for IDNR's Private Lands Programs.

Our monitoring data will ultimately be used to indicate whether and how CREP improves the biodiversity and productivity of fish, macroinvertebrate, and mussel assemblages and the health of stream ecosystem as the whole. Our analysis may be able to demonstrate under what natural environmental settings CREP would be most effective, how long CREP may take to positively affect stream ecosystems, and what is the minimum CREP rate in a watershed for significant effects on aquatic life. In addition, the long-term monitoring data is useful to indicate how extreme weather events, such as drought and high temperature may affect the ecological effects of CREP. Our better understanding of these questions could help IL-DNR to better manage the Private Lands Programs to achieve their biological goals, i.e., increasing aquatic species populations and restoring aquatic biodiversity.

Reporting:

During the reporting period (7/1/2018-12/31/2018) no formal reporting of this work to the scientific community has taken place. Preparations of a manuscript based on the thesis of one graduate student (Levi Drake) is ongoing.

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Tables & Figures:

Table 1. *List of focal species selected for sensitive species monitoring in the Kaskaskia Basin due to their potential for sensitivity to sedimentation as well as the total number of individuals measured (i.e. length and weight) in the 2018 sampling season.*

Common Name	Scientific Name	Family	Number Measured in 2018
Central Stoneroller	*Campostoma anomalum*	Cyprinidae	-
Red Shiner	*Cyprinella lutrensis*	Cyprinidae	170
Striped Shiner	*Luxilus chrysocephalus*	Cyprinidae	90
Redfin Shiner	*Lythrurus umbratilis*	Cyprinidae	138
Hornyhead Chub	*Nocomis biguttatus*	Cyprinidae	60
Silverjaw Minnow	*Notropis buccatus*	Cyprinidae	179
Bigmouth Shiner	*Notropis dorsalis*	Cyprinidae	162
Sand Shiner	*Notropis stramineus*	Cyprinidae	155
Creek Chub	*Semotilus atromaculatus*	Cyprinidae	-
Stonecat	*Noturus flavus*	Ictaluridae	-
Orangethroat Darter	*Etheostoma spectabile*	Percidae	113

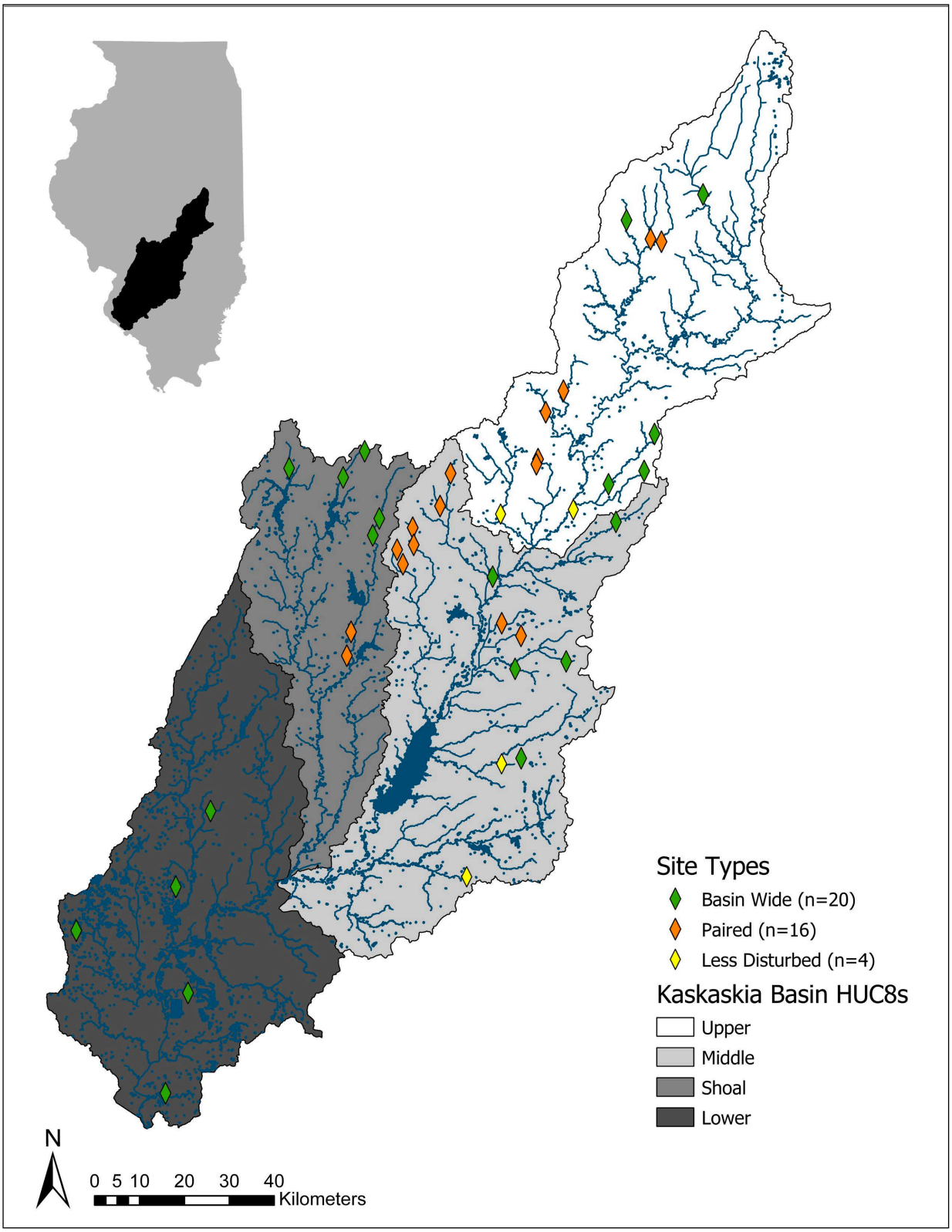

Figure 1. *Locations of 40 wadeable stream sites in the Kaskaskia River Basin of Illinois sampled in 2018. The basin is broken down to four United States Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) scale sub-basins (Upper, Middle, Shoal, & Lower). Site types included less disturbed (yellow, n=4), paired (orange, n=16), and basin-wide sites (green, n=20).*

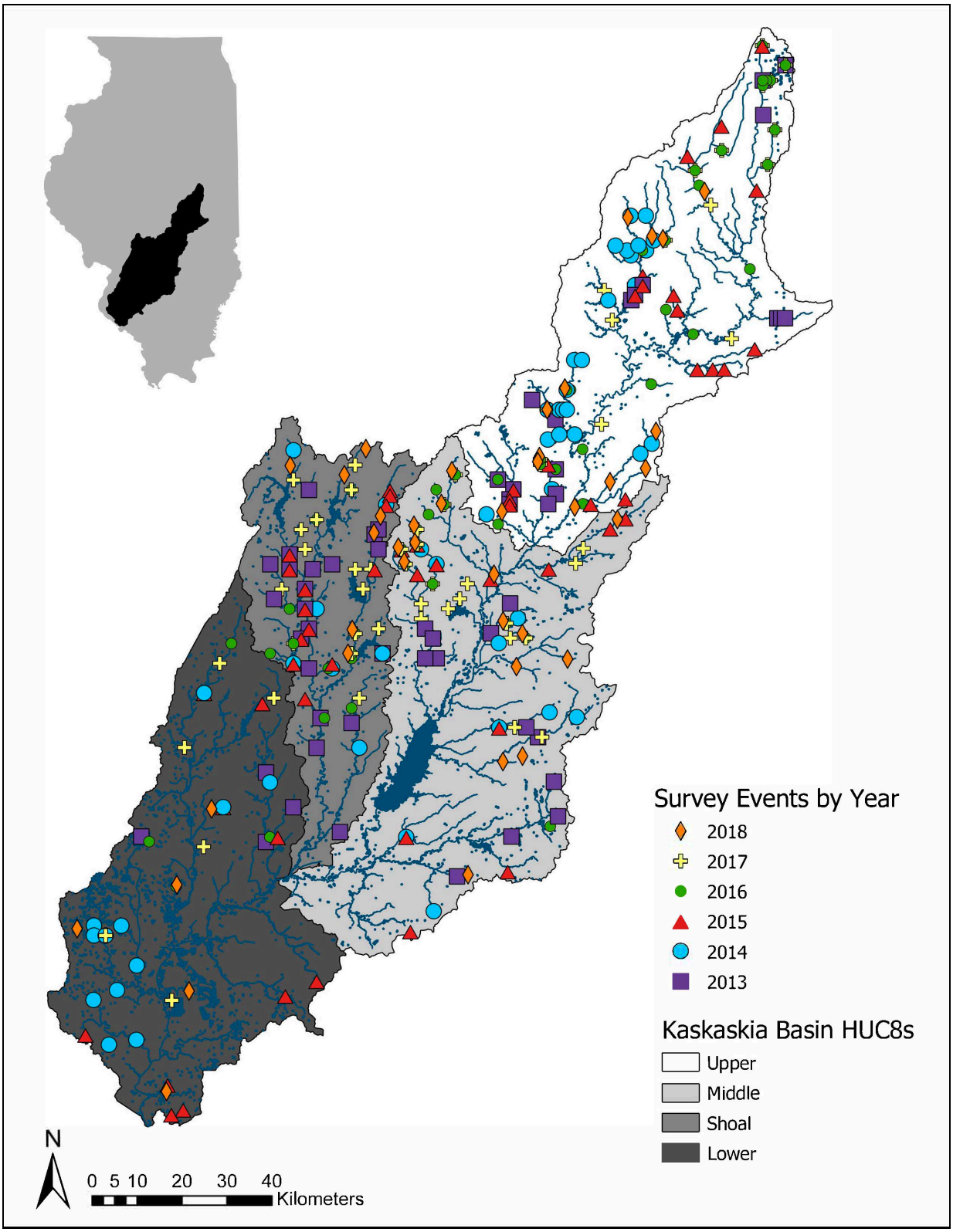

Figure 2. *Locations of wadeable stream sites in the Kaskaskia River Basin of Illinois sampled from 2013-2018 to monitor and assess aquatic life. Survey events vary by shape and color each year. (2018= orange, diamond; 2017= yellow, cross; 2016= green, small circle; 2015=red, triangle; 2014=blue, large circle; 2013= purple, square) The basin is broken down to four United States Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) scale sub-basins Upper, Middle, Shoal, & Lower).*